

**PANEL:**  
AsMA Renal Stone Panel

**TITLE:**  
Programmatic considerations to reduce the risk of adverse renal stone events in spaceflight

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## **Introduction**

Microgravity exposure may alter the likelihood that astronauts will experience renal stones. The potential risk includes both acute and chronic health issues, with the potential for significant impact on mission objectives.

## **Methods**

To understand the role of the NASA's Human Research Program (HRP) research agenda in both preventing and addressing renal stones in spaceflight, current astronaut epidemiologic data and a summary of programmatic considerations are reviewed.

## **Results**

Although there has never been a symptomatic renal stone event in a U.S. crewmember during spaceflight, urine chemistry has been altered – likely due to induced changes in renal physiology as a result of exposure to microgravity. This may predispose astronauts to stone formation, leading the HRP to conduct and sponsor research to: 1) understand the risk of stone formation in space; 2) prevent stones from forming; and 3) address stones that may form by providing novel diagnostic and therapeutic approaches.

## **Discussion**

The development of a renal stone during spaceflight is a significant medical concern that requires the HRP to minimize this risk by providing the ability to prevent, diagnose, monitor and treat the condition during spaceflight. A discussion of the risk as NASA understands it is followed by an overview of the multiple mitigations currently under study, including novel ultrasound techniques for stone detection and manipulation, and how they may function as part of a larger exploration medical system.